INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH IN ENGINEERING AND MANAGEMENT (IJSREM)
VOLUME: 05 ISSUE: 06 | JUNE - 2021 ISSN: 2582-3930

# Vertical Axis Wind Turbine

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**ABSTRACT**

With the recent surge in fossil fuels prices, demands for cleaner energy sources, and government funding incentives, wind turbines have become a viable technology for power generation. Currently, horizontal axis wind turbines (HAWT) dominate the wind energy market due to their large size and high power generation characteristics. However, vertical axis wind turbines (VAWT) are capable of producing a lot of power, and offer many advantages over (HAWT).

## I. INTRODUCTION

The rising concerns over global warming, environmental pollution, and energy security have increased interest in developing renewable and environmentally friendly energy sources such as wind, solar, hydropower, geothermal, hydrogen, and biomass as the replacements for fossil fuels. Wind energy can provide suitable solutions to the global climate change and energy crisis. The utilization of wind power essentially eliminates emissions of CO2, SO2, NOx and other harmful wastes as in traditional coal-fuel power plants or radioactive wastes in nuclear power plants. By further diversifying the energy supply, wind energy dramatically reduces the dependence on fossil fuels that are subject to price and supply instability, thus strengthening global energy security.
Wind energy has a number of benefits and advantages. Wind power is a clean and environmentally friendly energy source. As an inexhaustible and free energy source, it is available and plentiful in most regions of the earth.

## II. METHODOLOGY

1) Rotor blades take the energy out of the wind; they capture the wind and convert its kinetic energy into the rotational. The arc angle was selected based on the pervious study, which recommended an angle of 160.

2) The shaft is the part that gets turned by the turbine blades. It in turn is connected to the generator within the main housing. Means shaft coupled with generator.

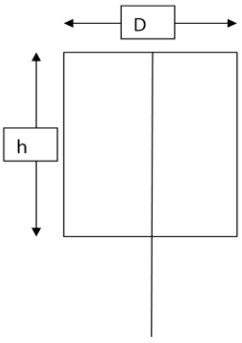
3) The conversion of rotational mechanical power to electric power is executed via way of means of generator.

4) The turbine controller control the output power and charges are stored in battery.

5) When we needed electrical power the battery can supply the power.

## III. DESIGN AND IMPLEMENTATION

*1) Design of Wind turbine-*




Ratio to be maintain at time of design :

h/D= 1.6 to 2

0.8/0.4=2

Area = 1.125m^2 its not sufficient area to provide required amount of power.

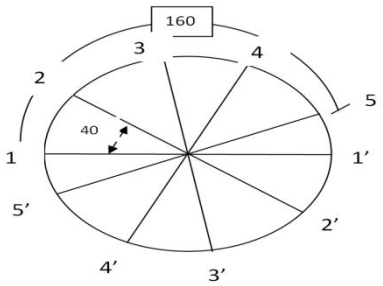
(as per our calculation table below)

0.9/0.5=1.8

Area=1.41m^2

P=1/2*rho*area*velocity*cp

*2) Shaft Blade angle*



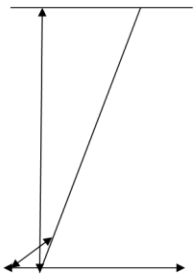

Length of 160 degree change of angle =

160/100*360=44.44%

44.44/100*2.54=1.128 (2.54=Diameter of shaft pipe)

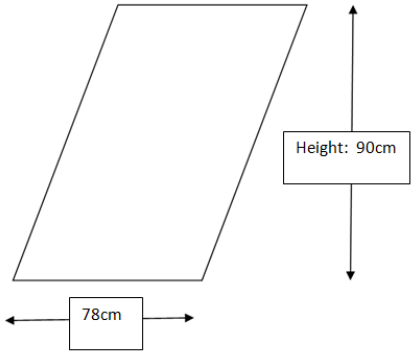
Length of 160 degree change of angle: 1.128cm

*3) Blade angle*



The length of change in angle is the length when the turbine rotation from 0 degree to 160 degree, they cover 1.128cm of a length.

*4) Blade design*




Circumference of circle is 2*pi*r/2=78.5cm

The height of blade is 90cm.

And width is 78cm.

## IV. CALCULATIONS

1) Area of Turbine
Width of turbine is = 1.57m
Height of turbine is 0.9m
Area is = width*height
1.57*0.9
=1.41m
2) Cp = Power coefficient which is 0.2836 (refer from blade angle table)
3) Velocity = wind speed m/s
4) Air density = 1.2kg/m3 common from above sea level

Power = ½*Air density*Area of Turbine*velocity of air*powercoefficient*efficiency of Generator

## V. GROWTH OF WIND ENERGY

There is a rapid growth in wind power development globally. This utilization of the wind for electricity generation is expanding quickly, due to large technological improvements, industry maturation and increasing concerns with greenhouse emissions associated with fossil fuel burning. Given the enormous wind resources, only a small portion of the usable wind potential is being utilized presently. Government and electrical industry regulations, as well as government incentives, have a large role in how quickly wind power will be adopted.

## VI. CONCLUSION

Local authorities in India, as well as the foreign authorities, will face, lots of problem in the near future due to lack of non-renewable energy sources. So, they are moving for the renewable energy sources like wind, solar energy, tides, rain, sea waves, geothermal heat…etc. Thus, by the researches related to the VAWTs, it is accepted to substantial step forward in this field in the foreseeable future. By introducing there search out comes to the country, it would gain for the national development.

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